VERSION OF AMENDMENTS WITH MARKINGS TO SHOW CHANGES

IN THE SPECIFICATION:

The paragraph beginning on Page 1, line 6 has been amended as follows:

The United States Government [may have] has certain rights [to] in this [the] invention. This invention was made under a CRADA (CRADA No. BG-00-441) between American Superconductor Corporation and Lawrence Berkeley National Laboratory operated for the United States Department of Energy.

The paragraph beginning on Page 16, line 1 has been amended as follows:

A crystallizable layer used in the methods of the invention can comprise any material that is capable of attaining crystalline structure, and thereby form a crystalline active layer. Such crystallizable layers include metals, mixed metals, rare earths, alkaline earths, semiconductors and compounds of same, including oxides, carbides, nitrides, borides, sulfides, chalcogenides and halides, and the like. A crystallizable layer can also include organic materials, such as organic polymers. Exemplary materials which the crystallizable layer can comprise include high temperature superconductors such as $YBa_2Cu_3O_{7-\delta}$ (where δ is greater than 0 and less than 0.5), $REZ_2Cu_3O_{7-\delta}$ (where RE is a rare earth or yttrium, Z is an alkaline earth element, and δ is greater than 0 and less than 0.5), Bi-Sr-Ca-Cu-O, Ti[l]-Ba-Ca-Cu-O, and the like; oxides such as $SrTiO_3$, Y_2O_3, RuO_2, ZrO_2, SiO_2, yttria-stabilized zirconia (YSZ), CeO_2, Al_2O_3, and the like; semiconductors such as Si, Ge, InP, GaSb, InSb, GaAs, InAs, (In,Ga)As, CdS, and the like; magnetic and magnetorestrictive materials such as $LaMnO_3$, Fe, NiO, Co, Ni, and the like; coatings for

tribological or hardness applications such as SiC, TiN, diamond and diamond-like coatings, and the like, and sensor materials such as ZnO, lead-zirconite-titanate, and the like.

The paragraph beginning on Page 17, line 15 has been amended as follows:

A crystallizable underlayer used in the methods of the invention can comprise any material that is capable of attaining crystalline structure, and can be either a layer deposited above the substrate but below the nucleating surface or can be the substrate itself. Such crystallizable underlayers include metals, mixed metals, rare earths, alkaline earths, semiconductors and compounds of same, including oxides, carbides, nitrides, borides, sulfides, chalcogenides and halides, and the like. A crystallizable underlayer can also include organic materials, such as organic polymers. Exemplary materials which the crystallizable underlayer can comprise include high temperature superconductors such as $YBa_2Cu_3O_{7-\delta}$ (where δ is greater than 0 and less than 0.5), $REZ_2Cu_3O_{7-\delta}$ (where RE is a rare earth or yttrium, Z is an alkaline earth element, and δ is greater than 0 and less than 0.5), Bi-Sr-Ca-Cu-O, Ti[l]-Ba-Ca-Cu-O, and the like; oxides such as $SrTiO_3$, Y_2O_3, RuO_2, ZrO_2, SiO_2, yttria-stabilized zirconia (YSZ), CeO_2, Al_2O_3, and the like; semiconductors such as Si, Ge, InP, GaSb, InSb, GaAs, InAs, (In,Ga)As, CdS. and the like; magnetic and magnetorestrictive materials such as $LaMnO_3$, Fe, NiO, Co, Ni, and the like; coatings for tribological or hardness applications such as SiC, TiN, diamond and diamond-like coatings, and the like, and sensor materials such as ZnO, lead-zirconite-titinate, and the like.

IN THE CLAIMS:

The claims have been amended as follows:

20. (amended) A method of growing a biaxially oriented crystalline formation comprising the steps of:

(a) contacting [an] a previously formed non-single-crystal orientable structure with an oblique particle beam, thereby forming in said structure a nucleating surface having increased biaxial orientation; and

(b) epitaxially growing said crystalline formation using said nucleating surface to promote the epitaxial growth.

25. (amended) The method of claim 23, wherein the composition of said crystallizable layer is selected from the group consisting of $REBa_2Cu_3O_{7-\delta}$ (where RE is a rare earth or yttrium, and δ is greater than 0 and less than 0.5), Bi-Sr-Ca-Cu-O, Ti[l]-Ba-Ca-Cu-O, $SrTiO_3$, Y_2O_3, RuO_2, ZrO_2, SiO_2, yttria-stabilized zirconia (YSZ), CeO_2, Al_2O_3, Si, Ge, InP, GaSb, InSb, GaAs, InAs, (In,Ga)As, CdS, $LaMnO_3$, Fe, NiO, Co, Ni, SiC, TiN, diamond, diamond-like coatings, ZnO, and lead-zirconite-titanate.

30. (amended) The method of claim 28, wherein the composition within the body of said structure is selected from the group consisting of $REZ_2Cu_3O_{7-\delta}$ (where RE is a rare earth or yttrium, Z is an alkaline earth element, and δ is greater than 0 and less than 0.5), Bi-Sr-Ca-Cu-O, Ti[l]-Ba-Ca-Cu-O, $SrTiO_3$, Y_2O_3, RuO_2, ZrO_2, SiO_2, yttria-stabilized zirconia (YSZ), CeO_2, Al_2O_3, Si, Ge, InP, GaSb, InSb, GaAs, InAs, (In,Ga)As, CdS,

$LaMnO_3$, Fe, NiO, Co, Ni, SiC, TiN, diamond and diamond-like coatings, ZnO, and lead-zirconite-titanate.

REMARKS

Reconsideration of this application is respectfully requested in view of the foregoing amendments and discussion presented herein.

1. Rejection of Claims 1-34 under 35 U.S.C. §103.

Claims 1-34 were rejected under 35 U.S.C. §103 as allegedly being unpatentable in view of the combined teachings of Russo et al. (U.S. No. 5,432,151) and Mao et al. (J. *Vac. Sci. Technol. A* **15**(5),Sep/Oct 1997). Of those claims, Claims 1, 2, 20, 33 and 34 are independent.

In support of the rejection, the Examiner asserted that Russo et al. teaches the claimed invention except for the beam creating biaxial orientation, and then relied on Mao et al. for allegedly providing that missing element. In response, the Applicant respectfully traverses the rejection and requests that the rejection be withdrawn for several reasons as set forth below.

First, the Examiner has not set forth the requisite *prima-facie* case of obviousness. Specifically, neither the Office Action nor the cited references provide the requisite motivation to combine the primary and secondary references in support of the rejection. It is respectfully asserted that the combination of references is a result of impermissible hindsight and accordingly, the rejection should be withdrawn.

Further, while Mao et al. teaches using an ion beam in a fabrication process, what is being taught by the cited reference is *ion beam assisted deposition* (p. 2687, second column, last paragraph at bottom right of the page). Clearly, as explained in the cited reference, bombardment takes place during deposition (p. 2688, first column, II. Experiment). This is an important distinction because the Applicant does not contact

the structure with a particle beam during deposition; to the contrary, in the Applicant's invention, exposure to the particle beam takes place either before or after, but not during, deposition.

As recited each of the pending independent claims, the Applicant contacts a *previously formed structure* with a particle beam. At page 5, lines 20-24 of the specification, the Applicant defines a previously formed structure as one that is *not being added to by a deposition step at the same time that the structure is being contacted by the particle beam such as in an IBAD process.* On the other hand, Mao et al. teaches use of a particle beam in an IBAD deposition process. Hence, Mao et al. teaches a completely different process and use of a particle beam.

Therefore, Mao et al. does not teach what the Examiner purposes that Mao et al. teaches, but Mao et al. is non-analogous art and actually teaches away from the Applicant's invention. As such, Mao et al. cannot be relied upon to reject the present claims.

And, even assuming that the combination of Russo et al. and Mao et al. was proper, the cited combination does not teach, suggest or provide motivation or incentive for the invention recited in the Applicant's claims because there would be no reason, based on the teachings of the two references, to contact a surface with a particle beam outside of a deposition process. Mao et al. is only interested in the characterization of the grain orientation of the crystal structure of the particular layer being worked on, and what is the optimum angle to promote in plane crystal growth. As stated above, Mao et al. teaches ion beam deposition. Similarly, the ion beam used by Russo et al. is used for bombarding the substrate during deposition. Neither reference by itself, nor the

combination of the two references, teaches, suggests or provides motivation or incentive for contacting the structure with a particle beam outside of the deposition process.

The Applicant's invention, as recited in the pending claims, is directed to contacting a previously formed structure with a particle beam, which structure, by definition, is not being added to by a deposition step at the same time the structure is being contacted by the particle beam. Furthermore, the particle beam must be applied at an oblique angle in relation to the surface of the structure to effect biaxial orientation. None of the references of record, singly, or in combination, teach, suggest or provide motivation or incentive for the aspect of the invention as recited in the pending claims.

Accordingly, the Applicant respectfully submits that Claims 1-34 are patentable over the cited references, and that the Examiner has not made out a *prima-facie* case of obviousness to support a rejection therefrom.

2. Correction of Typographical Errors.

The specification and Claims 25 and 30 have been amended to correct an obvious typographical error where "Ti" was inadvertently presented as "T1". Since "T1" is a chemical impossibility and the only other reasonable interpretation for "T1" as presented would be "Ti", entry of this amendment is proper. No new matter has been added.

3. Presentation of Claims 35-37.

Claims 35-37 have been added to recite the concept of using "two", "a plurality" and "multiple" particle beams during bombardment, respectively. Support for this amendment is found in the specification at page 12, lines 8-13.

New Claim 38 has been added to recite the concept of scanning or moving the beam relative to the structure that is desired to be contacted. Support for this amendment is found in the specification at page 12, lines 14-16.

New Claims 39-41 have been added to recite the concept of using the oblique particle beam to deposit onto a region of the structure contacted by the oblique particle beam a substance, in particular zirconia. Support for this amendment is found in the specification at page 10, lines 26-28.

New Claim 42 is added to reflect the concept that the oblique particle beam comprises one or more charged or uncharged particles selected from the group consisting of O_2, Ar, N_2, Ne and He. Support for this amendment is found in the specification at page 11, lines 1-4.

No new matter is added by the above amendments to the specification and claims. Entry is respectfully requested.

4. Conclusion.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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The Applicant also respectfully requests a telephone interview with the Examiner in the event that there are questions regarding this response, or if the next action on the merits is not an allowance of all pending claims.

Date: 9/27/02

Respectfully submitted,

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